

OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **CONTOOCCOOK LAKE** the program coordinators recommend the following actions.

FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stable, and slightly decreasing*, in-lake chlorophyll-a trend. While chlorophyll-a concentrations increased slightly over the course of the summer, the mean remained below the state mean reference line. Algal abundance decreased this season from 1999, and did not increase with the increase in phosphorus concentration in the upper water layer. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentration can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.
- Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *stable, but slightly decreasing*, trend in lake transparency. Water clarity slightly decreased this season, with no results being recorded in July. The mean clarity is still below the state mean. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.
- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters.

Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *slightly improving* trend for in-lake phosphorus levels, which means levels are generally decreasing. The average epilimnetic phosphorus concentration was only slightly above the New Hampshire median, while the hypolimnetic concentration was below the median. Phosphorus concentrations in the epilimnion were elevated this season in June and July, which may have been caused by rain in those months washing nutrients into the lake. The phosphorus concentrations in the hypolimnion decreased this season and the mean value is the lowest ever experienced for the lake. Results in September were quite low for both the epilimnion and hypolimnion. We hope to see results like these continue for the lake. One of the most important approaches to reducing phosphorus levels is educating the public. Humans introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

OTHER COMMENTS

- Contoocook Lake was plagued by *E. coli* problems in the Squantum and Townline Inlets this summer (Table 12). While the levels never exceeded the state standard for surface waters of 406 counts per 100 mL a few samples were over 200 counts per 100 mL. Two NHDES biologists walked the Squantum Inlet watershed with a lake resident in early July to pinpoint from where the elevated *E. coli* counts were originating. Our results were inconclusive, as there had not been a recent rain event. Unfortunately, we were not able to revisit the lake during a fall rain event. We would like to return in the spring, either during a snowmelt or rain event. If you are interested in accompanying our biologists on this trip, or if you know someone who knows the watersheds of Squantum and Townline Inlets well, please contact the VLAP Coordinator early this spring.
- Squantum Inlet continues to be a source of excess phosphorus to the lake (Table 8). While the mean total phosphorus concentration was actually reduced from the previous two years it remains in the excessive range for New Hampshire lakes (see the Chemical Monitoring Parameters section of the report). Again, the coordinators would like to sample this inlet in the spring. Controlling phosphorus inputs from the watershed will help keep concentrations at a desirable level.
- Conductivity levels in the watershed were generally lower this year than last (Table 6). Squantum Inlet, although continuing to have high *E. coli* and total phosphorus levels, had a great decrease from

the 1999 conductivity values. The higher amounts of rain in 2000 helped to flush pollutants from many bodies of water in New Hampshire.

NOTES

- Monitor's Note (6/23/00): Treated for milfoil on June 13, 2000 with Diquat.

USEFUL RESOURCES

Lake Eutrophication, WD-BB-3, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Anthropogenic Phosphorus and New Hampshire Waterbodies, NHDES-WSPCD-95-6, NHDES Booklet, (603) 271-3503

Nonpoint Source Pollution and Stormwater Fact Sheet Package. Terrene Institute. (703) 661-1582.

Bacteria in Surface Waters, WD-BB-14, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

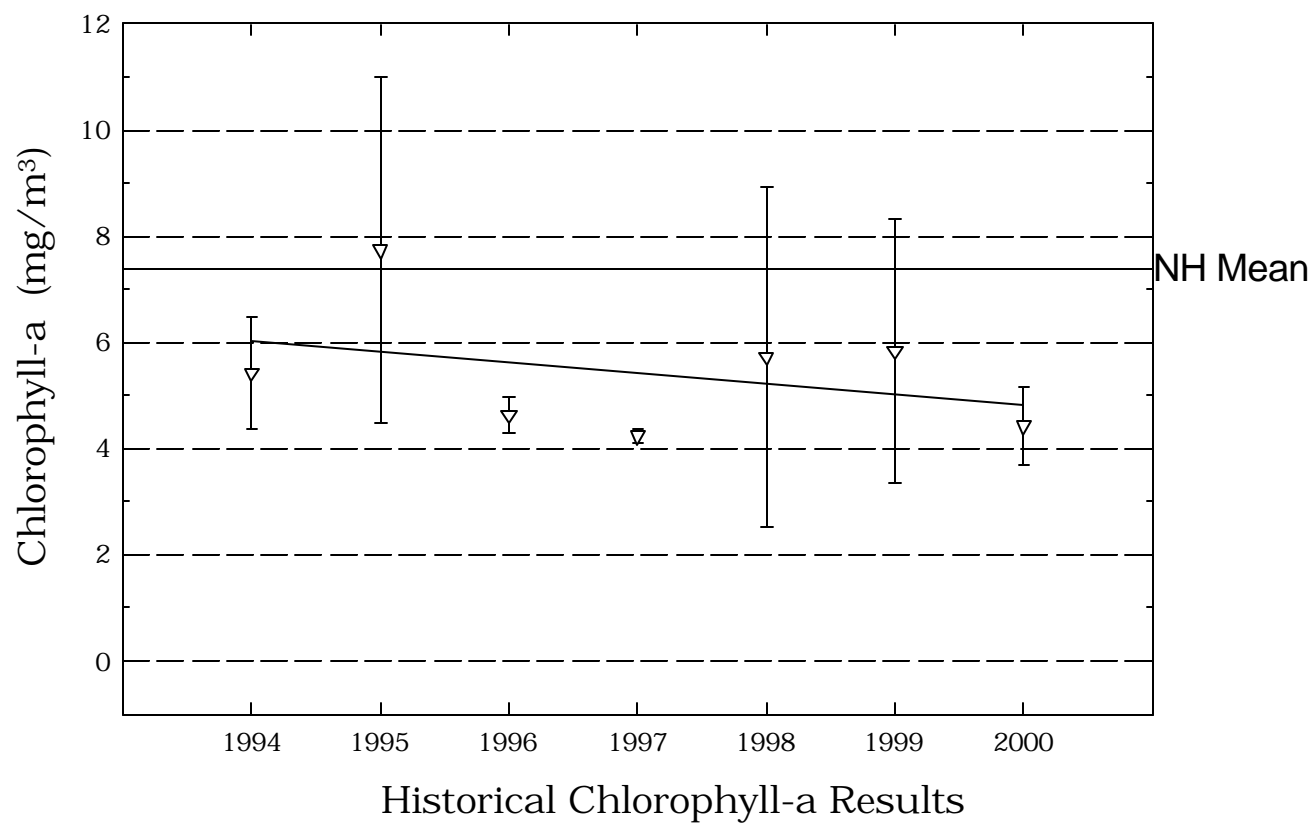
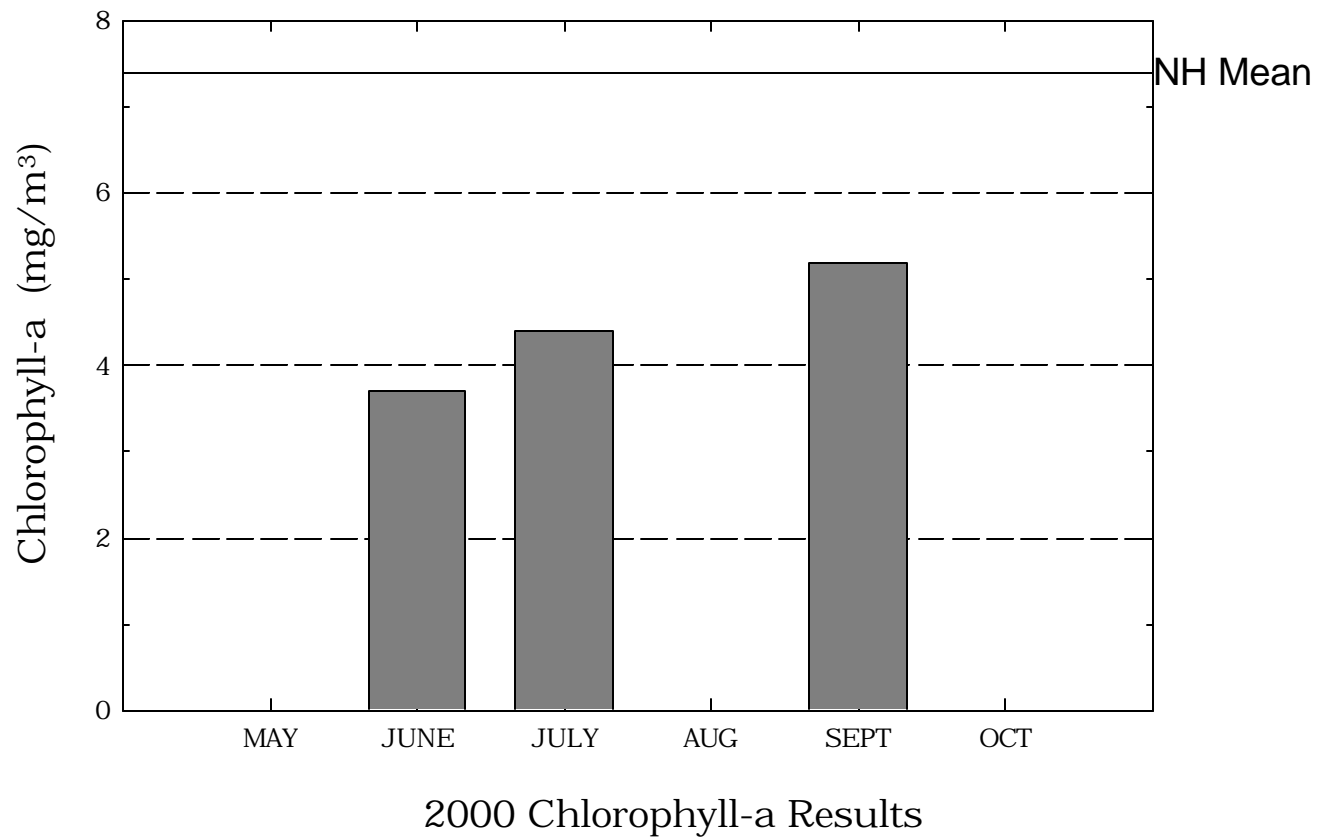
Answers to Common Lake Questions, NHDES-WSPCD-92-12, NHDES Booklet, (603) 271-3503.

Vegetated Phosphorus Buffer Strips, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

Water Milfoil, WD-BB-1, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

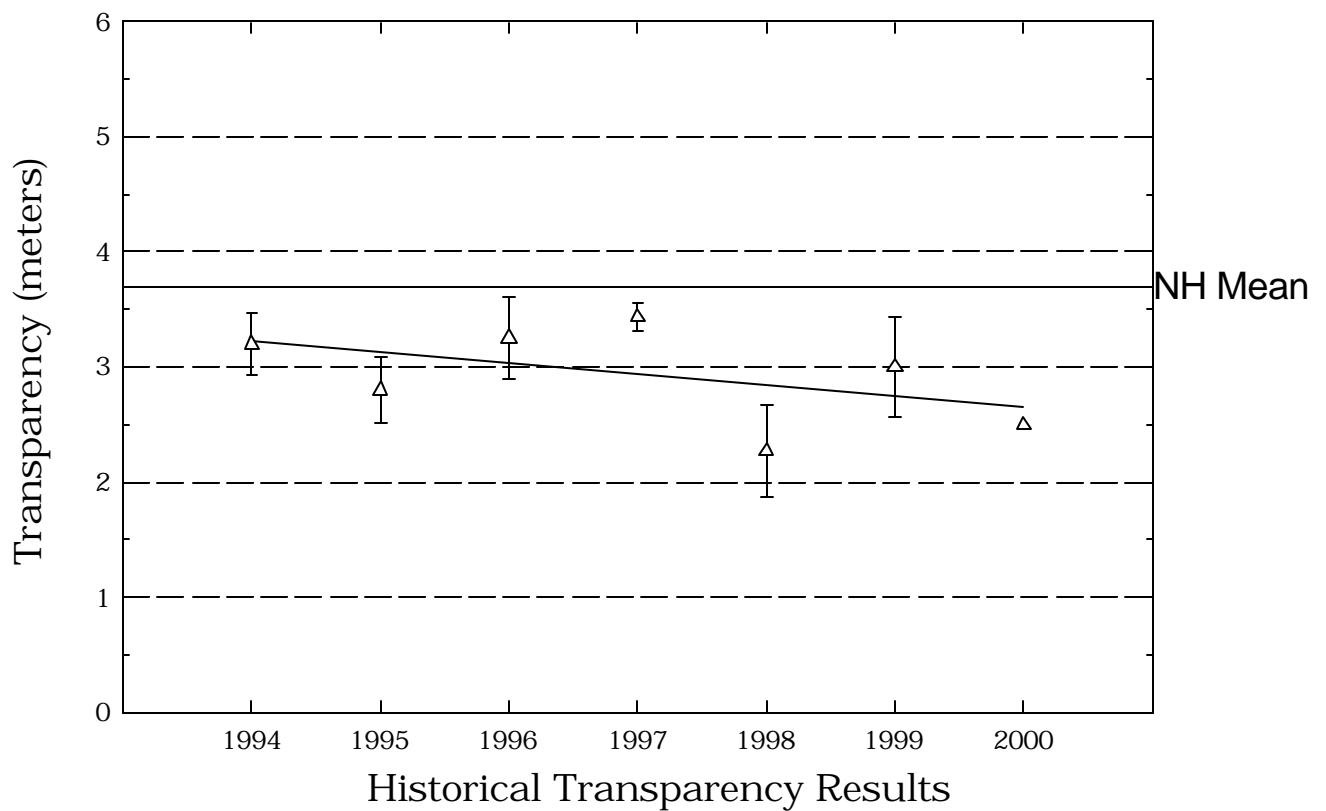
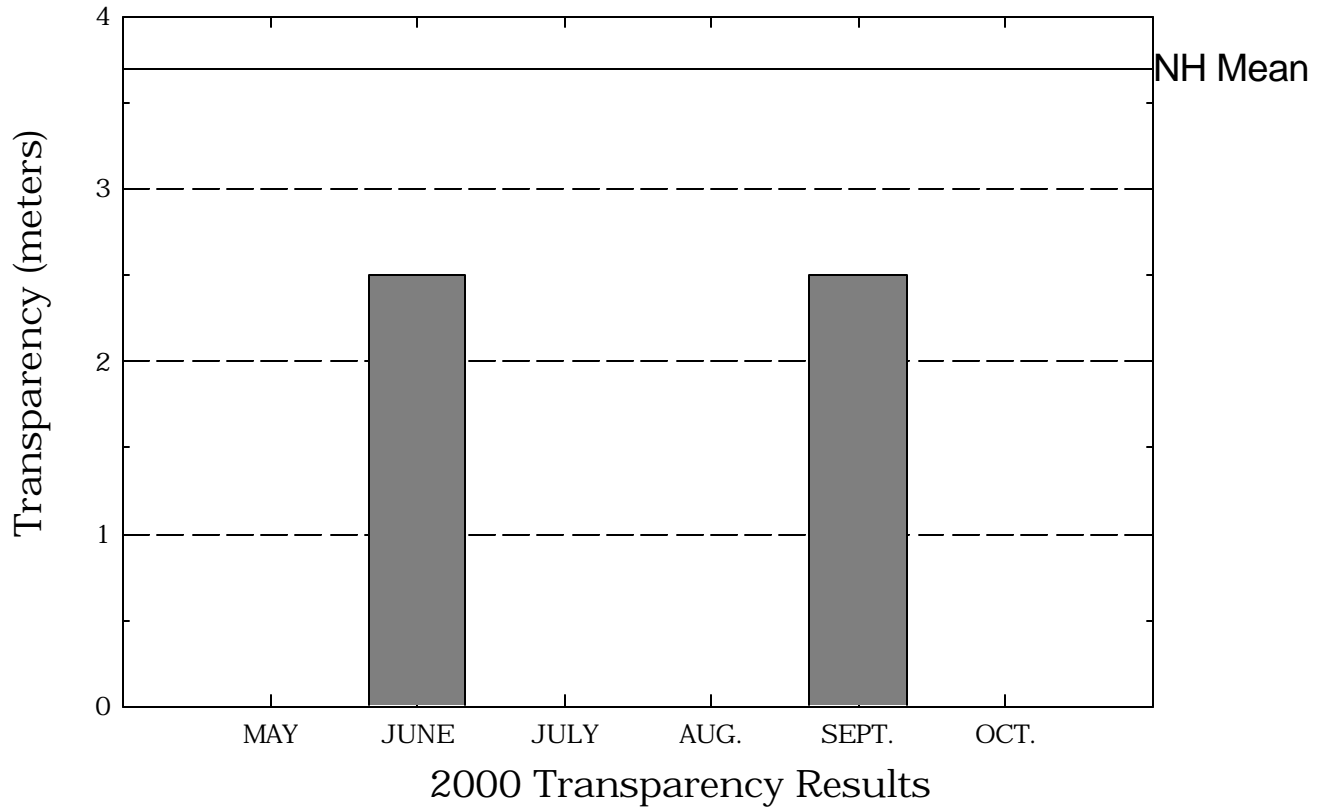
Contoocook Lake

Figure 1. Monthly and Historical Chlorophyll-a Results



Contoocook Lake

Figure 2. Monthly and Historical Transparency Results



Contoocook Lake

Figure 3. Monthly and Historical Total Phosphorus Data.

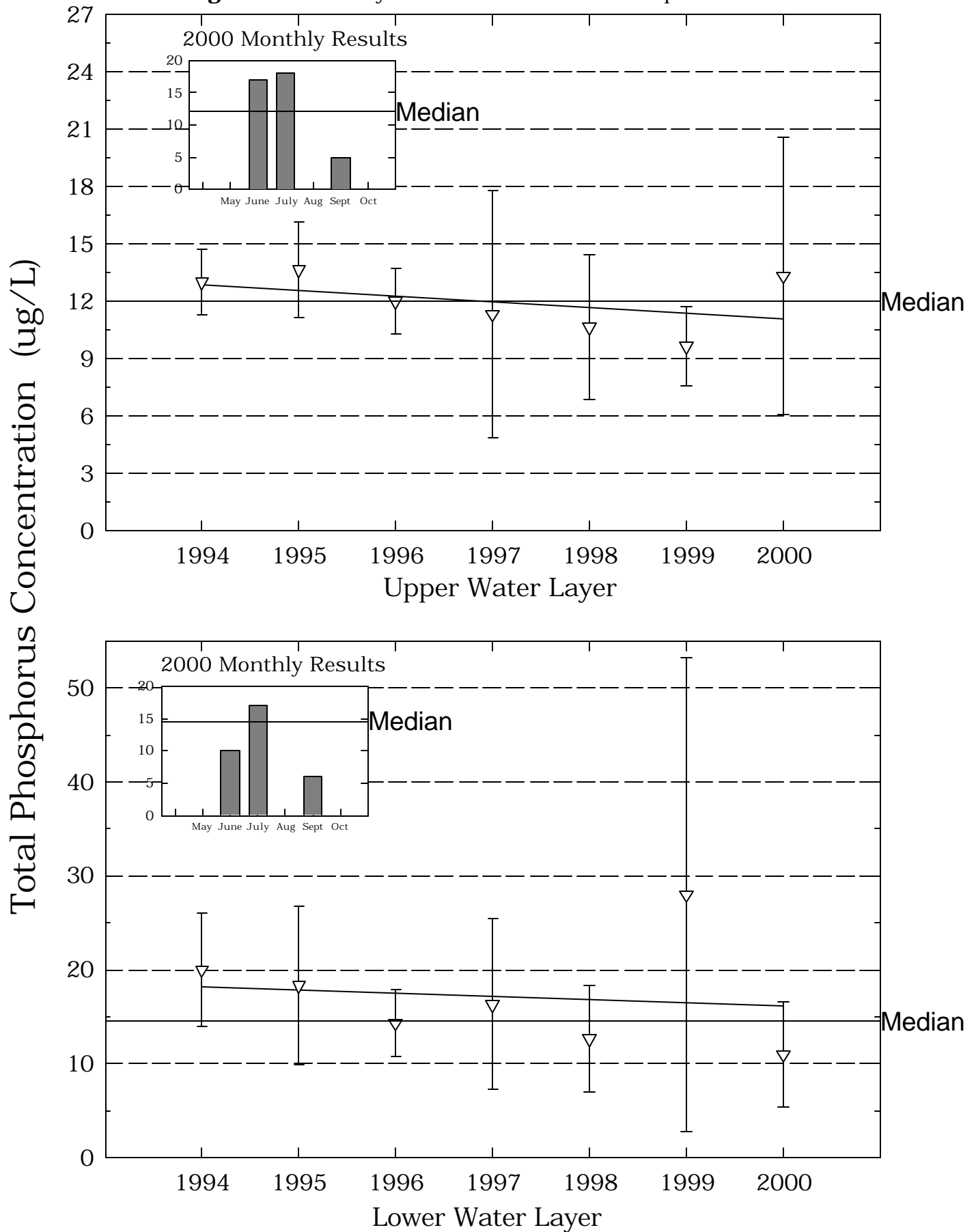


Table 1.**CONTOOCOOK LAKE****JAFFREY**

**Chlorophyll-a results (mg/m³) for current year and historical
sampling periods.**

Year	Minimum	Maximum	Mean
1994	4.55	6.59	5.42
1995	4.97	11.33	7.74
1996	4.24	4.91	4.63
1997	4.15	4.38	4.24
1998	2.37	8.79	5.72
1999	3.29	8.23	5.84
2000	3.70	5.18	4.42

Table 2.**CONTOOCOOK LAKE****JAFFREY****Phytoplankton species and relative percent abundance.****Summary for current and historical sampling seasons.**

Date of Sample	Species Observed	Relative % Abundance
06/17/1994	MICROCYSTIS	49
	ASTERIONELLA	31
06/09/1995	CHRYSOSPHAERELLA	74
	TABELLARIA	9
	ASTERIONELLA	8
06/07/1996	UROGLENOPSIS	30
	DINOBRYON	14
	ANABAENA	7
06/20/1997	DINOBRYON	93
	TABELLARIA	2
	SYNURA	2
06/19/1998	MALLOMONAS	23
	ANABAENA	18
	CYCLOTELLA	13
06/11/1999	DINOBRYON	68
	ASTERIONELLA	18
	TABELLARIA	4
06/23/2000	ASTERIONELLA	62
	RHIZOSOLENIA	11
	MALLOMONAS	6

Table 3.**CONTOOCOOK LAKE****JAFFREY**

**Summary of current and historical Secchi Disk
transparency results (in meters).**

Year	Minimum	Maximum	Mean
1994	3.0	3.5	3.2
1995	2.6	3.0	2.8
1996	3.0	3.5	3.2
1997	3.3	3.5	3.4
1998	1.8	2.5	2.2
1999	2.7	3.5	3.0
2000	2.5	2.5	2.5

Table 4.**CONTOOCOOK LAKE****JAFFREY****pH summary for current and historical sampling seasons.****Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
CHOWDER COVE INLET	1994	5.87	6.10	5.97
	1995	5.78	6.21	6.01
	1996	5.76	6.33	5.93
	1997	5.78	6.24	5.99
	1998	5.60	6.23	5.90
	1999	6.11	6.49	6.23
	2000	5.95	6.23	6.07
COCHRANE INLET EAST	1995	5.37	5.87	5.55
	1996	5.40	5.57	5.48
	1997	5.47	5.89	5.61
	1998	5.07	5.48	5.28
	1999	5.45	5.52	5.48
	2000	4.54	5.37	4.78
COCHRANE INLET WEST	1995	4.19	4.56	4.34
	1996	4.30	4.45	4.37
	1997	4.41	4.50	4.47
	1998	4.31	4.31	4.31
	1999	4.66	4.76	4.71
	2000	5.09	5.59	5.27
COCHRANE INLET	1994	5.76	6.35	5.97

Table 4.**CONTOOCOOK LAKE****JAFFREY****pH summary for current and historical sampling seasons.****Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
DAM OUTLET	1994	5.65	6.70	5.83
	1995	5.85	6.09	5.94
	1996	5.86	6.09	5.99
	1997	5.65	6.20	5.79
	1998	5.61	5.76	5.70
	1999	5.82	6.10	5.92
	2000	5.78	6.10	5.91
EPILIMNION	1994	6.45	6.78	6.55
	1995	6.29	7.33	6.61
	1996	6.27	6.89	6.49
	1997	6.41	6.83	6.59
	1998	6.48	6.59	6.55
	1999	6.65	6.83	6.73
	2000	6.24	6.71	6.41
HYPOLIMNION	1994	6.17	6.51	6.34
	1995	6.17	6.63	6.33
	1996	5.89	6.26	6.10
	1997	5.66	6.54	6.02
	1998	5.97	6.43	6.13
	1999	6.15	6.47	6.24
	2000	5.99	6.29	6.11

Table 4.**CONTOOCOOK LAKE****JAFFREY****pH summary for current and historical sampling seasons.****Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
METALIMNION				
	1999	6.25	6.53	6.33
SQUANTUM INLET				
	1994	6.36	6.36	6.36
	1995	6.38	6.45	6.41
	1996	5.95	6.39	6.11
	1997	6.18	6.54	6.27
	1998	6.25	6.29	6.27
	1999	6.36	6.54	6.41
	2000	6.20	6.51	6.33
TAFT INLET UPSTREAM				
	1997	6.82	6.82	6.82
	1998	6.54	6.54	6.54
TAFT INLET				
	1994	5.99	6.18	6.07
	1995	6.14	6.16	6.15
	1996	6.17	6.27	6.22
	1997	6.13	6.37	6.24
	1998	6.13	6.39	6.28
	1999	6.08	6.35	6.16
	2000	6.37	6.50	6.43
TOWNLINE INLET				
	1994	6.00	6.81	6.19
	1995	6.22	6.47	6.35

Table 4.**CONTOOCOOK LAKE****JAFFREY****pH summary for current and historical sampling seasons.****Values in units, listed by station and year.**

Station	Year	Minimum	Maximum	Mean
TOWNLINE INLET	1996	5.77	6.19	5.94
	1997	6.30	6.47	6.39
	1998	5.92	6.32	6.11
	1999	6.33	6.44	6.37
	2000	6.15	6.45	6.27
WALSH INLET	1994	6.37	7.36	6.59
	1995	6.42	6.79	6.54
	1996	5.83	6.74	6.06
	1997	6.36	6.62	6.46
	1998	5.76	6.71	6.13
	1999	6.54	6.90	6.64
	2000	6.39	6.43	6.41
WOODBOUND INLET	1996	6.43	6.43	6.43
	1997	6.75	6.75	6.75
	1998	6.55	6.55	6.55
	2000	6.53	6.68	6.60

Table 5.

CONTOOCOOK LAKE

JAFFREY

Summary of current and historical Acid Neutralizing Capacity.

Values expressed in mg/L as CaCO₃.

Epilimnetic Values

Year	Minimum	Maximum	Mean
1994	3.70	5.20	4.20
1995	3.50	31.20	12.80
1996	2.20	4.20	3.30
1997	2.80	3.70	3.23
1998	3.50	4.20	3.77
1999	3.30	4.40	3.73
2000	3.20	3.70	3.45

Table 6.

CONTOOCCOOK LAKE

JAFFREY

Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
CHOWDER COVE INLET	1994	70.6	76.7	73.6
	1995	61.4	115.4	82.1
	1996	63.0	64.8	64.0
	1997	62.8	72.5	69.1
	1998	50.3	79.6	63.3
	1999	71.5	117.1	91.7
	2000	69.4	77.8	73.6
COCHRANE INLET EAST	1995	31.6	33.2	32.4
	1996	36.8	50.0	43.4
	1997	35.1	42.3	38.5
	1998	50.4	54.3	51.9
	1999	72.3	73.7	73.0
	2000	78.9	99.8	89.4
COCHRANE INLET WEST	1995	96.3	109.8	103.0
	1996	86.5	104.6	95.5
	1997	99.0	118.5	106.5
	1998	67.9	67.9	67.9
	1999	98.8	99.9	99.3
	2000	88.3	91.2	89.7
COCHRANE INLET	1994	38.1	46.4	41.4

Table 6.**CONTOOCCOOK LAKE****JAFFREY**

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
DAM OUTLET	1994	71.2	87.7	79.9
	1995	69.4	75.3	71.8
	1996	67.3	73.2	69.6
	1997	66.7	84.8	76.7
	1998	69.5	85.4	77.7
	1999	86.2	106.7	95.4
	2000	79.4	87.9	83.6
EPILIMNION	1994	62.7	69.1	66.7
	1995	62.0	69.0	66.0
	1996	58.5	61.8	60.1
	1997	60.9	62.0	61.4
	1998	56.0	61.9	58.1
	1999	67.8	69.6	68.7
	2000	66.0	66.2	66.1
HYPOLIMNION	1994	65.1	69.3	67.7
	1995	62.3	69.7	66.5
	1996	58.6	62.8	61.0
	1997	59.2	63.5	61.5
	1998	59.0	64.8	61.8
	1999	69.7	75.4	72.4
	2000	66.3	67.0	66.6

Table 6.

CONTOOCCOOK LAKE

JAFFREY

Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.

Station	Year	Minimum	Maximum	Mean
METALIMNION				
	1999	67.6	70.3	68.8
SQUANTUM INLET				
	1994	183.1	183.1	183.1
	1995	140.5	151.9	146.2
	1996	150.7	271.0	194.8
	1997	137.1	239.4	175.4
	1998	86.6	340.5	249.3
	1999	225.0	329.7	264.5
	2000	129.9	140.2	135.0
TAFT INLET UPSTREAM				
	1997	422.0	422.0	422.0
	1998	260.3	260.3	260.3
TAFT INLET				
	1994	279.0	342.0	310.5
	1995	349.0	354.0	351.5
	1996	314.8	321.3	318.0
	1997	250.0	380.0	315.4
	1998	62.9	359.0	223.1
	1999	323.0	405.5	355.5
	2000	304.0	362.0	333.0
TOWNLINE INLET				
	1994	60.5	72.4	66.6
	1995	50.6	100.2	71.9
	1996	40.2	59.9	49.3

Table 6.

CONTOOCOOK LAKE

JAFFREY

**Specific conductance results from current and historic
sampling seasons. Results in uMhos/cm.**

Station	Year	Minimum	Maximum	Mean
	1997	51.7	64.1	57.0
	1998	40.3	61.4	53.9
	1999	69.9	80.7	73.9
	2000	43.6	53.6	48.6
WALSH INLET				
	1994	45.4	66.0	58.3
	1995	28.0	42.5	35.1
	1996	28.2	37.6	32.4
	1997	26.9	28.2	27.5
	1998	24.3	29.6	27.3
	1999	29.6	31.0	30.4
	2000	27.6	31.9	29.7
WOODBOUND INLET				
	1996	172.7	172.7	172.7
	1997	180.2	180.2	180.2
	1998	113.8	113.8	113.8
	2000	181.7	199.0	190.3

Table 8.**CONTOOCOOK LAKE****JAFFREY**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
BROOK #1				
	1997	8	8	8
CHOWDER COVE INLET				
	1994	19	32	25
	1995	10	23	15
	1996	18	22	20
	1997	15	31	25
	1998	14	26	20
	1999	13	21	18
	2000	10	17	13
COCHRANE INLET EAST				
	1995	9	12	10
	1996	6	15	10
	1997	3	82	30
	1998	1	24	16
	1999	4	10	7
	2000	< 5	9	7
COCHRANE INLET WEST				
	1995	9	13	11
	1996	9	12	10
	1997	4	19	11
	1998	1	1	1
	1999	7	11	9
	2000	5	12	8

Table 8.**CONTOOCOOK LAKE****JAFFREY**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
COCHRANE INLET				
	1994	6	9	7
DAM OUTLET				
	1994	12	20	15
	1995	13	23	16
	1996	7	15	11
	1997	2	13	7
	1998	12	15	13
	1999	8	19	13
	2000	6	14	9
EPILIMNION				
	1994	12	15	13
	1995	11	16	13
	1996	11	14	12
	1997	4	16	11
	1998	8	15	10
	1999	8	12	9
	2000	5	18	13
HYPOLIMNION				
	1994	16	27	20
	1995	13	28	18
	1996	11	18	14
	1997	6	23	16
	1998	8	19	12
	1999	11	57	28

Table 8.**CONTOOCOOK LAKE****JAFFREY**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
METALIMNION	2000	6	17	11
	1999	8	16	11
SQUANTUM INLET	1994	49	49	49
	1995	87	109	98
	1996	46	66	55
	1997	75	111	92
	1998	66	209	126
	1999	116	348	202
	2000	85	103	91
TAFT AT TRAILER PARK	1996	5	5	5
TAFT INLET UPSTREAM	1997	94	94	94
	1998	21	21	21
TAFT INLET	1994	21	63	42
	1995	28	30	29
	1996	18	69	43
	1997	4	26	17
	1998	11	74	36
	1999	23	53	40
	2000	10	41	24

Table 8.**CONTOOCOOK LAKE****JAFFREY**

**Summary historical and current sampling season Total
Phosphorus data. Results in ug/L.**

Station	Year	Minimum	Maximum	Mean
TOWNLINE INLET	1994	20	25	23
	1995	16	25	19
	1996	14	21	17
	1997	5	19	13
	1998	9	17	12
	1999	12	27	20
	2000	11	18	14
WALSH INLET	1994	15	96	47
	1995	25	44	34
	1996	21	27	24
	1997	20	33	27
	1998	15	32	23
	1999	15	23	19
	2000	14	21	18
WOODBOUND INLET	1996	7	7	7
	1997	14	14	14
	1998	16	16	16
	2000	17	27	21

Table 9.
CONTOOCOOK LAKE
JAFFREY

Current year dissolved oxygen and temperature data.

Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 23, 2000			
0.1	21.5	7.8	88.3
1.0	21.3	7.8	88.0
2.0	21.0	7.7	86.9
3.0	20.9	7.5	84.3
4.0	20.1	6.9	76.5
5.0	18.2	5.1	54.4
6.0	14.7	2.1	20.4

Table 10.**CONTOOCOOK LAKE****JAFFREY****Historic Hypolimnetic dissolved oxygen and temperature data.**

Date	Depth (meters)	Temperature (celsius)	Dissolved Oxygen (mg/L)	Saturation (%)
June 17, 1994	6.0	16.9	1.9	19.0
June 9, 1995	6.5	13.0	0.2	2.0
June 7, 1996	6.5	11.3	1.0	9.0
June 20, 1997	6.0	12.7	0.5	4.0
June 19, 1998	7.0	13.0	0.2	2.0
June 11, 1999	6.5	13.7	1.4	13.6
June 23, 2000	6.0	14.7	2.1	20.4

Table 11.

**CONTOOCCOOK LAKE
JAFFREY**

**Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
CHOWDER COVE INLET	1997	0.8	1.1	1.0
	1998	0.5	2.8	1.4
	1999	0.5	0.9	0.7
	2000	0.5	0.6	0.5
COCHRANE INLET EAST	1997	0.3	5.0	2.0
	1998	0.1	20.0	7.0
	1999	0.4	0.5	0.4
	2000	0.3	0.5	0.4
COCHRANE INLET WEST	1997	0.1	0.3	0.2
	1998	0.1	0.1	0.1
	1999	0.3	0.4	0.3
	2000	0.4	0.4	0.4
DAM OUTLET	1997	0.3	0.4	0.4
	1998	0.4	0.8	0.6
	1999	0.3	0.9	0.6
	2000	0.4	0.6	0.5
EPILIMNION	1997	0.4	0.7	0.5
	1998	0.5	2.4	1.2
	1999	0.5	0.7	0.6
	2000	0.5	0.7	0.6
HYPOLIMNION				

Table 11.

**CONTOOCCOOK LAKE
JAFFREY**

**Summary of current year and historic turbidity sampling.
Results in NTU's.**

Station	Year	Minimum	Maximum	Mean
	1997	0.6	3.2	1.6
	1998	0.7	10.6	5.2
	1999	2.0	28.0	14.1
	2000	0.7	1.2	1.0
METALIMNION				
	1999	0.5	0.9	0.7
SQUANTUM INLET				
	1997	0.8	0.8	0.8
	1998	0.6	2.0	1.2
	1999	0.7	2.8	1.5
	2000	0.7	0.7	0.7
TAFT INLET UPSTREAM				
	1997	2.7	2.7	2.7
	1998	3.5	3.5	3.5
TAFT INLET				
	1997	0.5	1.4	0.8
	1998	0.5	32.0	11.1
	1999	0.7	2.5	1.4
	2000	0.8	4.4	2.6
TOWNLIN INLET				
	1997	0.7	1.8	1.1
	1998	0.5	1.4	1.0
	1999	0.9	2.1	1.5
	2000	0.7	1.1	0.9
WALSH INLET				
	1997	0.7	1.1	0.9

Table 11.

CONTOOCOOK LAKE

JAFFREY

Summary of current year and historic turbidity sampling.

Results in NTU's.

Station	Year	Minimum	Maximum	Mean
	1998	0.6	1.0	0.9
	1999	0.7	1.0	0.8
	2000	0.7	1.3	1.0
WOODBOUND INLET				
	1997	3.5	3.5	3.5
	1998	6.1	6.1	6.1
	2000	3.9	7.8	5.8

Table 12.

CONTOOCCOOK LAKE

JAFFREY

Summary of current year bacteria sampling.
Results in counts per 100ml.

Location	Date	E. Coli
See Note Below		
CHOWDER COVE INLET	August 3	64
	September 4	64
	October 15	14
COCHRANE COVE	October 15	5
HUNT RD	June 23	49
	August 6	85
	August 24	118
	October 15	45
SQUANTUM INLET A	July 3	19
SQUANTUM INLET B AIRPORT	July 3	15
SQUANTUM INLET C YIPPY	July 3	21
SQUANTUM INLET	June 23	90
	July 3	2
	July 30	307
	August 3	163
	August 6	148
	August 24	156
	September 4	163
	October 15	13
TAFT INLET UPSTREAM	June 23	36

NOTE: "<" means "less than" and ">" means "greater than"

Table 12.

CONTOOCOOK LAKE

JAFFREY

**Summary of current year bacteria sampling.
Results in counts per 100ml.**

Location	Date	E. Coli
		See Note Below
TOWNLINE INLET	June 23	125
	July 30	96
	August 3	233
	August 3	233
	August 3	233
	August 24	171
	September 4	223
	October 15	11
WOODBOUND INLET	June 23	46